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AUTHOR Etienne, G.
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ABSTRACT

Reviewed is the role of the World Health Organization (WHO) in the education and training of professional specialists in the field of environmental health. Particular emphasis is given to the environmental engineer. Cooperation between WHO and Unesco in this field is stressed. The World Health Organization has evolved a comprehensive program designed to assist Member States in developing the types and numbers of personnel required in the field of environmental health. The goals of this program are included in this paper. (Author/MA)

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The Education and Training of Environmental Manpower in Connexion with Health

SUMMARY

This paper reviews the rôle of the World Health Organization (WHO) in the education and training of professional specialists - particularly engineers - in the field of environmental health.

The co-operation between WHO and Unesco in this field is stressed.

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THE EDUCATION AND TRAINING OF ENVIRONMENTAL MANPOWER IN CONNEXION WITH HEALTH

by G. Etienne, Chief Sanitary Engineer for Manpower in Environmental Health, Division of Health Manpower Development, WHO, Geneva

The world-wide concept of environmental sanitation has its origin in the International Sanitary Conference held in Paris in July 1851, which discussed, inter alia, the nature of epidemic diseases and their relation to sanitary, meteorological and geophysical conditions.[1] Nonetheless, concerted international effort aimed at fostering the environmental sanitation profession has a rather short history. Indeed, it has its origin in 1913 in the Rockefeller Foundation's cooperative programme with various governments in the development of services within existing governmental structures that were designed to promote health through the prevention of diseases. The Foundation's work with the national public health agencies stimulated interest in the role and functions of the sanitary engineer. It also influenced the sanitation programme of the Institute of Inter-American Affairs (IIAA) established in 1942 by the United States of America for overseas technical assistance. The forte of the technical assistance programme of the Rockefeller Foundation, the IIAA and its successor agencies resides in the emphasis laid on public health, environmental sanitation and sanitary engineering.

The contribution of the United Nations agencies to the promotion of sanitary engineering has its roots in the first WHO-sponsored Expert Committee on Environmental Sanitation[2] which was convened in Geneva in September 1949. The Expert Committee considered that the general objectives of WHO in controlling the diseases due to insanitary environments should be:

> "(a) complete international control of the major pandemic diseases, particularly cholera, plague and epidemic typhus;
>
> (b) general control of all the major endemic diseases in this group;
>
> (c) the encouragement of sanitary measures of all types with the object of promoting general well-being as well as mere limitation of disease."

Soon afterwards, in 1950, WHO sponsored a seminar at the Hague which discussed the relation of engineering to health. Attended by leading engineers and health administrators from 15 European countries, the seminar was followed:

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firstly, by a resolution of the Fourth World Health Assembly recommending that in all Member States provision should be made for the training and employment of adequate numbers of public health engineers, town planners, architects and other allied personnel, and requesting the Executive Board and the Director-General to give all possible help in the creation of training facilities; secondly, by the second session of the WHO Expert Committee on Environmental Sanitation[3] which was convened in Geneva in October 1951. This Committee devoted its attention to the specific problem of the education, training and utilization of personnel for environmental sanitation.

The degree to which the field of environmental health has expanded its purview, twenty years after the first Expert Committee on Environmental Sanitation, is well illustrated in the definition afforded the term by the WHO Expert Committee on National Environmental Health Programmes: Their Planning, Organization and Administration[4]. In the views of this Committee, environmental health refers to "the ecological balance that must exist between man and his environment in order to ensure his well-being". Yet, in June 1972, the United Nations Conference on the Human Environment added new dimensions to the concept which, to date, encompasses man in his total relation to his environment, including the physical, biological, socio-economic and socio-cultural considerations. In this context, it includes such diverse problems as radiation, industrial hygiene engineering, land use, human settlements, atmospheric pollution, public recreation and tourism, etc.

In analysing the problem of the health hazards of the human environment in its interdisciplinary nature, it becomes quite clear that almost all the traditional branches of learning are involved to some degree. Therefore, the promotion of human environment requires an understanding of the natural sciences, the humanities and social sciences, as well as those factors which determine human attributes and behaviour.

The relationship of environmental conditions to the status of human health has been recognized, since the early days of medicine. It is specifically emphasized in two documents: the "Report on an Inquiry into thethe Sanitary Considitions of the Labouring Population of Great Britain"

and the "Report of the Sanitary Commission of Massachusetts" published in the United Kingdom and the United States in 1842 and 1850 respectively[5]. Truly, as one group of informed specialists recognizes, "the environment has always been a determinant of the presence and quality of life - human and non-human"[6]. This notwithstanding, environmental health manpower has received relatively low priority. Even though it has long been established that, for instance, a safe water supply and the sanitary disposal of wastes can do more to ensure a population's sound health than any battalion of health workers involved in curative services, these have invariably, over the years, received primary attention.

The early environmental sanitation workers included public health inspectors and sanitary engineers. The then practising personnel were identified with sanitary inspections, promotion of programmes of sanitary importance, the design of water supply and sewerage systems, and facilities for waste disposal. When it became evident that the design, maintenance and operation of these facilities required some knowledge of chemistry and biological sciences, the expanded requirements of personnel to work in the environmental sanitation field were reflected in the following definitions which also set the frame for the determination of the role of the sanitary engineer and public health sanitarian:

> "Sanitary engineers, also known as public health engineers, are assumed to have a broad and thorough understanding of the whole range of environmental conditions that affect human well-being, to be well qualified by aptitude, training and experience to serve as true professionals at the various levels of responsibility relating to the environmental in public health and associated organizations, and, in the upper echelons, to be able to take their place alongside their counterparts in other professions in assuming responsible administrative and other public health functions. In addition, they should possess the skills required to prepare the design and to supervise the construction and operation of sanitary works."[7]

> "A public health sanitarian is a person whose education and experience in the biological and sanitary sciences qualify him to engage in the promotion and protection of the public health. He applies technical knowledge to solve problems of a sanitary nature and develops methods and carries out procedures for the control of those factors of man's environment which affect his health, safety and well-being."[8]

In dealing with the specific problem of the education, training and utilization of personnel for environmental sanitation, the WHO Expert Committee on Environmental Sanitation, which met in October 1951, proposed a broad array of personnel which are involved directly in the practice of sanitation: sanitary engineers, plant operators, specialists (chemists, biologists, entomologists, etc.), sanitarians (the latter grouped into three classes under the titles "health inspector", "health assistant", and "health aide). In addition, the Committee also laid emphasis on the ways in which other members of the health team (medical officers of health, public health nurses and health visitors, personnel engaged in personal health services, etc.), should direct their own activities toward effecting improvements in the environment. The WHO Expert Committee of 1969, to which reference is made earlier in this paper, identified three basic types of environmental health manpower, including:

> "Professional workers: public health physicians; sanitary and public health engineers; civil, chemical, mechanical, and electrical engineers; chemists; health physicists; biologists, including bacteriologists, entomologists, and malacologists; and public health inspectors.
>
> "Sub-professional and skilled workers: health assistants, technicians, operators, workshop and office staff, corresponding to the various professional groups.
>
> "Semi-skilled and unskilled workers: health aides, drivers, plant operators, storekeepers, labourers, orderlies."[9]

The numbers and types of personnel required in environmental health activities varied a great deal from one country to the other, depending on the country's priorities and organizational structure of its health and environmental health services. In the USSR, for example, the sanitary physician is the key environmental professional, having specialized in sanitation and hygiene during a six-year course. In the UK, engineers concerned with sanitary installations and facilities work in close collaboration with the public health departments of the responsible local authorities, which are manned by medical officers of health and sanitary

inspectors among others. The public health sanitarian is the key professional group in the UK and in many Commonwealth countries, whereas the sanitary engineer is the primary professional in a number of developing countries, including Morocco, Turkey, India, Iran, Pakistan and in Latin America. In the US, environmental health manpower is classified into three broad categories. Environmental engineers, scientists and technologists comprise the professional group. The mid-level workers include technicians and assistants, with some specialization in environmental matters. Aides, constituting the third group, receive vocational training or its equivalent in on-the-job training.

The education of the sanitary/environmental engineer in the US has been the topic of three national conferences held at Harvard University in 1960, at Northwestern University in 1967, and at Drexel University in 1973. The first two conferences concentrated on undergraduate and graduate education, in the full knowledge of the expanding role of the sanitary engineer - or rather the environmental engineer - the new name adopted by the American Sanitary Engineering Intersociety Board in 1964. The conferences established guidelines for curricula in environmental engineering, and provided direction in regard to certain special educational problems, including those related to the accreditation of professional graduate programmes.

On the international scene, WHO played a leading role in the education and training of environmental health personnel, professional and technical. In pursuing the basic objectives of its education and training programmes WHO undertook, during the 1960-1970 decade, to convene a series of meetings of specialized professionals. These specialists were specifically involved with the problems of the environment and of training personnel for service in the realm of environmental health. The following, which include other activities such as the organization of seminars, training courses, expert meetings, the elaboration of training manuals and reference books, the stimulation of research, etc., are worthy of mention: the publication of monographs such as Water Supply for Rural Areas and Small Communities (Monograph Series No. 42); International Standards for Drinking Water,

2nd edition, 1963; a monograph presenting up-to-date knowledge on various aspects of air pollution (Monograph Series No. 46, Air Pollution, 1961); Public Health Paper No. 13: Aspects of Water Pollution Control, 1962; Public Health Paper No. 6: Ionizing Radiation and Health, 1961; Proceedings of the Second Seminar on Radiation Health Protection: Protection of the Public in the Event of Radiation Accidents, 1965; the organization of Expert Committees and Scientific Groups on: Public Health Aspects of Housing, TRS No. 225, 1961; Environmental Health Aspects of Metropolitan Planning and Development, TRS No. 297; Appraisal of the Hygienic Quality of Housing and its Environment, TRS No. 353, 1967; Air Pollution, TRS No. 271, 1964; Water Pollution Control, TRS No. 318, 1966; Treatment and Disposal of Wastes, TRS No. 367, 1967.

For the implementation of the massive continental programme in water supply, the Pan American Health Organization, the Regional Office of WHO for the Americas, took aggressive action on three broad fronts: strengthening schools of engineering and schools of public health, establishing a continental system of continuing professional education and a system for the training of subprofessional and technical manpower, stimulation of research projects on environmental engineering subjects. It also established at Lima, Peru, a Pan American Sanitary Engineering Centre for research and service to Member States in the field of environmental health. Similarly, the other five WHO Regional Offices sponsored and assisted the establishment and the strengthening of education and training centres for engineers and sanitarians in a large number of Member States. In addition an interregional Sanitary Engineering Centre was set up in 1969 at Rabat, Morocco, in collaboration with the University Mohammed V.

Of particular importance are the following WHO-supported activities which characterized the period under review: the symposium convened by WHO in 1965 on Engineering Education and Training Programmes in Environmental Health[10]; the Expert Committee on the Education of Engineers in Environmental Health[11] in 1967, and the publication in 1970 of a volume entitled The education and training of engineers for environmental health. This documentation provides guidelines for the education of the kind of engineer

who will be needed in the last part of the twentieth century, and indicates the trends that will influence the planning of curricula for his training. At the technical level, the Conference on the Training and Utilization of Auxiliary Sanitation Personnel[12], held in New Delhi in June 1968, identified deficiencies of training programmes and described proposals for the future and plans for improvement.

It should be recalled that the concern of WHO is in the specific health sector of problems of the environment. This consideration serves also to distinguish the Organization's role in connexion with issues falling within the purview of health, from the role of other intergovernmental agencies and organizations which are participating in an attack at the international level on the problems of environmental change. These underlying principles are reaffirmed in Resolution WHA26.59 on the development of environmental manpower adopted by the World Health Assembly in May 1973. Inter alia, the Resolution requests the Director-General:

> "to provide assistance and means of coordination for the preparation and implementation of programmes at the regional and inter-regional levels for the training of specialists in health, human ecology and environmental sciences and technology;
>
> "to contribute to these training programmes in so far as budgetary resources permit, by providing fellowships and qualified teaching staff, by organizing long-term and short-term courses, seminars and other meetings in order to promote the acquisition of skills and the exchange of knowledge and information, on the basis of a systematic approach to the planning of training, and by studying the possibility of designating international and regional centres for the training of environmental manpower;
>
> "to continue to collaborate with other intergovernmental institutions and with the nongovernmental organizations concerned with a view to coordinating the various aspects of the training programmes."

In response to this resolution, WHO has evolved a comprehensive programme, the overall objective of which is to assist Member States in developing the types and numbers of personnel required in the field of environmental health.

More specifically, the programme aims at:

(a) promoting studies and investigations with a view to developing practical working guidelines for the formulation of environmental health manpower and educational policies, and defining methodological approaches to manpower planning and development in environmental health;

(b) strengthening existing national, regional and interregional training programmes in environmental health, and in the establishment of new programmes to include research (as a component of teaching/learning, continuing education, and linking educational activities with manpower development;

(c) establishing international and regional reference services, the organization of workshops, seminars and other meetings for the exchange of knowledge and information, the preparation of handbooks, the promotion of research on educational planning and technology, in order to improve the quality of education and the educational delivery system in environmental health;

(d) organizing long-term and short-term courses and multiprofessional education courses for teacher training and the training of specialists in human ecology and environmental sciences and technology in connexion with health.

In addition, WHO called a consultation meeting[13] which was held from 29 April through 1 May 1974. The report of the consultation describes the functions of the engineer in the assessment and control of environmental conditions and hazards that affect man's health. In the views of this group of informed specialists, the health-oriented engineer plans, administers and coordinates environmental health programmes carried out by health and other government departments, by public bodies and private organizations and enterprises. He performs similar tasks to those of a civil, chemical

or mechanical engineer, but concentrates on the conception, design, construction, operation, maintenance and surveillance of specialized facilities, e.g. those necessary for the control of the quality of air, land and water resources and of man's personal and working environment, in particular facilities for water supply, waste-water and solid waste disposal, vector control, healthful housing, food safety, noise control, radiation protection, disposal of obnoxious gases, chemicals and industrial water, and evaluates the performance of such works. In collaboration with health officers and scientists, he assesses environmental conditions, organizes and supervises programmes for the monitoring and surveillance of the quality of man's environment, participates in the elaboration of statements on expected environmental impact of physical development programmes; carries out research and investigations, assists in setting standards in physical and urban planning and in evaluating adequacy and effectiveness of control programmes and measures for the protection of man's health and well-being. Finally, he organizes studies on related economkc, financial, managerial and legal feasibility.

It must be well understood that no one engineer can have an education and competence in all the work areas cited above, and that environmental health programmes require teamwork involving the participation of various types of engineers, public health officers and scientists, all of whom should have, through their education and training, a common understanding of the ultimate objective to be achieved.

The current WHO programme of assistance in health manpower stresses the need for systematic manpower and educational planning for the continuing surveillance of manpower requirements, development and utilization, and emphasizes the common purpose of manpower development and service. As early as 1969 a WHO internal document ("Handbook for teachers of health sciences" produced by the African Region of WHO) disseminated information on the subject of educational planning. This handbook has since been reviewed and is replaced by the document "Guide pédagogique" (HMD/76.1) which will receive

wide distribution. In October/November 1974, WHO arranged for a workshop at the Sanitary Engineering Centre in Rabat, Morocco, on the modern educational methods and techniques as these apply to the teaching of sanitary engineering. The original French version of the report of the workshop is available for distribution, as will soon be the English version.

The thrust of the WHO action in environmental health manpower planning is the study recently initiated by the WHO Regional Office for Europe. The most salient features of this undertaking are as follows.

The study has been initiated in connexion with the Regional Office's long-term programme in environmental pollution control and in response to the Assembly resolution WHA26.59 referred to above. The overall objective of the study is to survey manpower requirements in environmental health in the European Region, including the various categories of personnel at operative and executive level, as a basis for evaluating current training programmes and preparing new ones. In order to achieve this objective, the study also includes activities related to the development of pilot studies which are designed to obtain data regarding the personnel currently employed in performing various functions; to identify the manpower mixes; to develop indices and useful correlations between different categories of personnel required and parameters relating to the extent of services rendered; and to develop and test a methodology for planning and forecasting future manpower requirements.

To secure balanced national development and to foster fuller international collaboration, WHO has taken every opportunity of work with other international agencies, particularly with UNESCO in the field of education and training in sanitary engineering, as well as in other fields. WHO has worked with UNESCO and with the Inter-American Association of Sanitary Engineers on a glossary of engineering terms designed to assist understanding of technical information by different language groups. It has also collaborated with UNESCO on the health aspects of arid zone and humid tropical zone development. On aspects of basic biology and the effects of radiation, WHO collaborated with IAEA and UNESCO in a symposium held in London in 1962.

UNESCO participated in the symposium convened by WHO in 1965 on "Engineering and Training Programmes in Environmental Health". UNESCO was also represented at the WHO-sponsored Expert Committee which met in Geneva in July 1967 on the Education of Engineers in Environmental Health.

With a view to closer cooperation between the two Organizations, an informal meeting was held on 1 December 1967 at UNESCO Headquarters. At this meeting, which was attended by high officials at both Organizations, agreement was reached on several points related to engineering education projects of mutual interest to UNESCO and WHO. The most important outcome of the meeting was the suggestion that working meetings of staff members of both Organizations to discuss specific problems connected with collaboration should be organized periodically. Throughout 1968 working meetings were arranged, the purpose of which was to explore the best way of implementing the proposed and indeed much desired collaboration between the two Organizations. These meetings proved to be extremely useful and provided a broad exchange of views over a wide range of technical subjects. As a result of the informal meeting of December 1967, UNESCO and WHO collaborated in the initiation of an engineering education project in Nairobi, Kenya. The teaching of environmental health as part of the civil engineering curriculum is being carried out in Kenya through a WHO-sponsored project.

In recent years, because of both organizations' reiterated desire for closer collaboration, new arrangements have been made which will facilitate joint planning of programmes of common interest. It is also contemplated that consultations should be organized which would review proposals prepared by one or the other organization for financing from outside sources.

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